DIRTY AND DANGEROUS:
Health Care Waste Management within MSF settings
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1. Introduction

Despite all hygiene precautions taken, nosocomial infections affect at least 10% of patients entering health structures in high-income countries (1,2). The main reasons are insufficient hand washing between consultations and the use of non-sterile invasive devices. Not surprisingly, the risk of nosocomial infections is even higher in low income countries. For example, the nosocomial infection rate in India is between 30 and 35% (3). The reasons for nosocomial infections in low income countries are insufficient hygiene and bad medical practices, but also to some extent incorrect health care waste management (HCWM).

Medical staff are also at risk of infections: many studies emphasise the risk of transmission of HIV and other blood-borne viruses like Hepatitis B through needle stick injuries: up to 40% of injuries occur when re-sheathing a used needle (4).

The risk of needle stick injuries is also an important factor among non-medical staff when handling the waste, because they are unaware of the potential risks and do not or are not provided with appropriate protective measures (5). The risk of HIV infection by this route seems rather low because the virus does not remain viable for long in the open; this is not the case for hepatitis B, which can survive at least several weeks in the ambient environment. An additional problem is encountered by injuries produced by sharps that serve as entry points for other infections, especially when handling highly contaminated dressings, fluids or body parts.

Typical contamination and transmission routes of diseases related to health care waste are:

- **Direct contact with waste:** needle stick injuries, ingestion (through hand-mouth contact), of untreated or recycled waste or contaminated residues following incineration at low temperature.
- **Airborne transmission:** fungal diseases, smoke emissions containing pathogens and hazardous by-products (e.g. dioxins, furans) when waste is burned at low temperatures in a poorly designed incinerator or when incineration is not properly conducted.
- **Pollution of water resources and the environment:** untreated waste polluting surface, groundwater and/or soil with chemical substances or pathogens (faecal coliforms and tetanus, polio and hepatitis).
- **Contact through vectors.**

Multiple routes of transmission suggest that many categories of people are at risk. These include:

- **Medical staff** working in health centres.
- **Patients** (in particular if immuno-compromised) and their **visitors**.
- **Cleaners and Health Care Waste personnel** handling waste inside and outside health centres.
- **People recycling or using** recycled medical material.
- **The population, especially children living in the direct neighbourhood** where health care waste is dumped or left adjacent to incinerators.
- **The community, through contaminated water.**

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The potential hazards associated with health care waste management justify considering this issue as a public health concern.

MSF’s HCWM was initially designed for short, emergency interventions. With the spread of HIV, increasing involvement in urban settings, chronic instability, longer-term programmes and environmental awareness, MSF has been rethinking its approach through the International Working Group on HCWM established in 1997. This has resulted in a complete HCWM approach that can be used in different health structures in all kinds of situations through modification of existing technologies. (Further adaptations to this general approach may be required according to the national legislation and the local context and constraints.)

2. Approach

2.1. Definition of Health Care Waste

Health care waste refers to all "waste" generated in the different kinds of health care structures including excreta, wastewater, dead bodies, and medical-related waste. In high-income countries, the generated medical waste is often classified in different categories, of which certain categories are subjected to extremely rigorous regulations that demand complicated and very expensive (2 - 4 $/kg) destruction and disposal methods with high-tech solutions.

These solutions are all too often projected onto low-income countries without considering if they are appropriate (available?) or not. Because these countries vary greatly in level of available resources, it is not surprising that HCWM, which is not perfect in high-income countries, most often fails. For this reason, Médecins Sans Frontières recommends the implementation of simplified, affordable, efficient methods of HCWM.

MSF classifies all medical related wastes based on their “common disposal properties”:

- **Sharps.** These can result in perforations or cuts (e.g. needles, scalpels, ampoules, broken glass).
- **“Soft” waste.** Comprises all "solid" medical waste other than sharps, organic or hazardous waste, including dressings (wet or dry), packages, paper, carton, plastic and syringes without needles. A separation between contaminated and non-contaminated soft waste is normally not recommended for low-income countries, as it can be complicated and demands for extreme supervision.
- **Organic waste.** Includes placentas, aborted foetus, amputated limbs, blood and food residues.
- **Hazardous Waste.** Includes laboratory waste (chemicals and bio-hazardous), pharmaceutical waste, X-ray related/radioactive waste and specific waste (e.g. engine oil and batteries from ambulances, broken or unused appliances containing mercury, insecticides).

2.2. Objectives of Health Care Waste

Health structures should be responsible for ensuring that all their health care waste is harmless to all populations potentially at risk.

**Good HCW management results in waste being:**
\[ ⇒ \text{non infectious.} \]
\[ ⇒ \text{and/or inaccessible for the population.} \]

Waste is most safely disposed when all conditions are fulfilled.

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3. Where, When and by Who?

Correct hygiene and health care waste management should be implemented and promoted in all Health Structures, from the smallest health post to the biggest hospital, including structures such as nutritional feeding centres, cholera treatment centres, medical laboratories, and during mass vaccinations. Furthermore, this should be done in all situations, from the beginning of an emergency through to the duration of long-term projects. HCWM should even be foreseen as part of emergency preparedness.

Statistics from high-income countries show that waste handlers handling the waste outside the health structure will have up to a 4 times greater chance of becoming infected by HIV than staff working inside the medical facilities (6). Therefore, the possible treatment and final disposal should preferably be done at the health centre, in a well-defined area (the waste zone). This principle has the following advantages:

- Waste remains under the control of the staff of the medical facility, which should receive a proper training.
- Treatment and final disposal of the residues can be done in a protected waste zone by clearly defined, well-trained and supervised persons equipped with the right protective gear.

If waste must leave the compound (e.g. soft waste that cannot be incinerated in an urban area), it should be rendered harmless beforehand, preferably through sterilisation by autoclaving.

All personnel, as well the medical as the non-medical staff, who are involved in hygiene and come in contact with health care waste should be exposed to the correct management and promotion. In addition, patients, attendants and visitors should not be forgotten in the promotional component.

4. Recommendations (7)

The three main categories of medical waste that will be found in nearly every medical facility are sharps, “soft” waste, and organic waste. Hazardous wastes are less common, but demand extra attention because of the technical requirements for disposal (specialist advice can be asked at MSF headquarters).

To achieve a correct health care waste management, several technical steps must be taken into account: segregation, collection and possible temporary storage, treatment and/or final disposal. The entire technical process should preferably be done on the compound of the health structure to limit possible accidents (e.g. needle stick injuries).

4.1. Segregation

Medical waste should be segregated according to the different categories at the time when and at the place where they are generated by (Para-) medical staff. Attempting to segregate at any other place or time introduces additional and non-acceptable risks.
4.2. Collection and temporary storage

The medical waste collection should be done by the cleaners, or ideally by the one or two waste managers who are responsible for and specialised in HCWM. It is important that the cleaners and waste managers receive adequate training, and use the necessary working gear and equipment such as overalls, boots, heavy-duty gloves and wheelbarrow.

4.3. Treatment

Few waste treatment methods are appropriate or available in the field. Burning, and preferably incineration, remain the most suitable waste treatment methods in low-income countries for soft waste. This may not be possible, however, in urban situations where space to build an incinerator is limited or the smoke generated would not be acceptable. Small rural health structures could also be an exception where the production of medical waste is limited and the available space on the compound is sufficient for on-site land filling.

As soft waste represents the biggest quantity of all medical waste generated in a health structure, it is important that the volume is reduced drastically to save space. Burning the soft waste with a temporary drum incinerator can achieve this objective in emergencies and in very small rural health structures. However, burning with a low temperature burner does not achieve the other objectives of treating medical waste however, which is to render it:

- Decontaminated (solid residues and smoke)
- Inoffensive (rendering solid residues unrecognisable and smoke as non-toxic as possible)

For normal health structures in mid- and long-term settings a permanent auto-combustible incinerator is recommended. For good durability and performance, these incinerators should preferably be built with refractory (heat-resistant) bricks and double combustion chambers. They should be pre-heated to get the best performance possible with limited means (8).

Incineration means the complete reduction of waste into ashes. The safe destruction of sharps and organic waste by incineration demands very high temperatures, which are impossible to reach with auto-combustible incinerators. This would also require the addition of a lot of fuel, which makes the treatment process unaffordable for low-income countries. Therefore, MSF recommends that sharps and organic waste are not incinerated with the simple means available on the field.

4.4. Final disposal

If possible, every health structure should have a waste zone composed of several facilities:

- A temporary storage area,
- An incinerator,
- Different waste pits (sharps pit, residues or ash pit, organic waste pit),
- A place to wash waste recipients.

The size of the waste zone depends on the capacity (size and number of interventions) of the health structure. The different treatment/disposal facilities must be kept close together, have a limited contaminated area and provide a practical working environment for the waste manager. However, sufficient space should be foreseen to extend the waste zone when old pits are full.
4.5. **Management of the medical waste categories**

4.5.1. **Sharps**

Needles should not be re-sheathed and must be discarded in the sharps container without the syringe, except for mass vaccination campaigns (9).

The sharps containers, which should be available in each room where sharps are generated, must be puncture-resistant and have a lid with a hole small enough to prevent this waste from spilling out. We recommend the use of sturdy empty plastic drugs containers with a small triangular opening made in the lid, which should be glued on. These should be readily available and affordable in low-income countries, as the drugs containers are waste anyway.

When the container is almost full it should be stored in a designated location for the waste managers to collect and transport to the waste zone. The intact, unopened container should be disposed off directly into the sharps pit without prior treatment (burning or incineration). This encapsulation technique can be made out of concrete for long-term interventions or a 200 litre drum for emergencies.

An alternative to these disposable recipients is the MSF Reusable Sharps' Container (RSC). This temporary storage recipient, which has been designed for all kinds of sharps, has the advantage that it can be emptied safely in the sharps pit without the user being exposed to its content. It can also be reused after cleaning and disinfection.

4.5.2. **Soft waste**

Plastic disposal bags would be preferable as a soft waste recipient as they are easy to collect, transport, and dispose of. However, they are often too expensive for low-income countries and therefore not always a good "sustainable" solution. Plastic buckets of at least 20 litres, of good quality and with a tight fitting lid can be an acceptable alternative.

The number of buckets has to be sufficient to allow rotation: at least once a day, or when a bucket is almost full, the maintenance personnel must collect them; each must immediately be replaced by an empty and clean bucket from the waste zone. It is recommended to have at least one reserve bucket in every (treatment) room.

The soft waste has to be stored within the waste zone, if it is delivered between burning/incineration periods. However, the temporary storage should not last longer than 24 h in hot regions and 48 h in cold regions. These buckets of soft waste can be stored intact or can also be emptied in bigger containers (covered; maximum 60 litres) within the waste zone. The empty bucket needs to be washed and disinfected with a chlorine solution by the person responsible for the waste zone before it can be reused.

After burning or incineration, the residues should be disposed off in a refuse (ash) pit, which should be covered with soil or a lid.
4.5.3. Organic waste

Organic waste contains a lot of liquid, making it very difficult to incinerate. It is best to put the medical organic waste (placentas, amputations) in plastic bags (preferable biodegradable), although reusable plastic buckets with tight-fitting lids are an acceptable alternative. Organic waste must be collected as soon as possible after the medical intervention and disposed of immediately in the ventilated organic waste pit without prior treatment. Some wood ashes can be added to reduce the bad odours of the organic waste pit before the lid is closed.

In certain cultures the tradition is for the family to take the placenta home. For small medical structures, the placentas are often thrown in the latrines. These habits have certainly to be avoided for unborn foetuses, and also for amputated limbs, which do not completely decompose.

4.5.4. Hazardous waste

Incorrect elimination of hazardous waste can be extremely harmful to the environment and represent a serious public health hazard (e.g. contamination of potable water resources, emissions of dioxins). These wastes have to be managed on a case-by-case manner. Therefore it is recommended to contact specialists when hazardous waste needs to be disposed off.

For pharmaceutical waste some common and preliminary rules can be put forward:
- First of all, pharmaceutical waste should be left in its original packing and enclose them in a separate and locked stock.
- For correct elimination procedures of drugs a list of expired products should be sent to headquarters. The following rules should be respected:
  - Items should be ranked according to the MSF list per category and per alphabet (e.g. Oral drugs)
  - The following information should be included for each product:

<table>
<thead>
<tr>
<th>International code</th>
<th>Generic name</th>
<th>Dosage</th>
<th>Quantity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DORAAA1BE4T-</td>
<td>Albenzole</td>
<td>400 mg, tab</td>
<td>3000 pces</td>
<td>224.4 Euro</td>
</tr>
<tr>
<td>DORACLOF1T-</td>
<td>Clofazimine</td>
<td>100 mg, tab</td>
<td>1000 pces</td>
<td>103.7 Euro</td>
</tr>
</tbody>
</table>

MSF has produced a list of all viable elimination options in low-income countries for every essential drug that we use in the field based on WHO recommendations (11) and for all laboratory chemicals. Based on this information you will be provided with all the elimination options per drug and MSF’s preferred option. You will also receive the protocols for all the selected elimination procedures.

The above rules should be respected as much as possible for all other hazardous waste. The more information that is provided at the start, the better and the faster recommendations can be given.

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5. Organisation and Planning

The main objective of a HCWM system is to improve safety. However, technical solutions alone are not sufficient for correct HCW management. The users and workers will be mainly interested in an easier and less time consuming manner of working. Therefore, the management system must combine safety features with easy to use measures, adapted to the needs, habits and culture of the users.

For correct planning and organisation of Health Care Waste Management, it is necessary to follow all the different steps of the “Project Cycle”:

- Assessments
- Problem analysis: with introduction to the Hygiene Committee
- Planning the strategy
  - Defining a strategy
  - Formulating a written agreement
  - Providing a budget
- Implementation:
  - "Technical" training of the staff
  - Supply and set up of the equipment
  - Start the "technical" process
  - Vaccination of staff against Hepatitis B and tetanus (recommended).
  - Promote the correct disposal of waste to the patients and their visitors
- Monitoring: from the start of the technical process
- Evaluation: mid-term and final

MSF has developed the manual 'Hygiene and Health Care Waste Management Promotion in Health Structures' (12) to deal with the Planning and Organisation within the facilities, focusing on assessments, training and consultation of staff. This practical manual, with lots of tools and extensive exercises can soon be ordered at MSF headquarters.

6. Conclusions

Proper HCW Management is important in all health structures for guaranteeing maximal protection of patients, medical and non-medical staff, and the surrounding population.

The MSF International Working Group has produced pragmatic recommendations for correct health care waste management in low-income countries, including both technical solutions and topics related to human behaviour.

Encouraging results have been obtained so far but further field testing will be necessary to improve the health care waste management in low income countries, an issue that is absent from much of the literature.
References


This paper is based on the MSF internal document:
DIRTY AND DANGEROUS: How to Manage Health Care Waste in MSF Health Structures?
By Marie-Claire Durand, Joos Van Den Noortgate, Christophe Nothomb

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